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ABSTRACT

This article discusses the effects of the Regional Technology Assistance Program (RETA) on the teaching practices and collegial behaviors of its participants and instructors. It presents findings that suggest that, as a result of their involvement in RETA's ongoing, peer-directed, constructivist-based professional development workshops, teacher participants and teacher instructors have: (1) increased their use of technology in the classroom; (2) increased their use of certain constructivist practices in the classroom; (3) increased their collaboration with other teachers; and (4) assumed more leadership positions. Successful reorientation of teachers from direct instruction to constructivist teaching methods must alter teachers' epistemologies. Professional development, must address the beliefs held by educators and the methods in which they incorporate those beliefs into their teaching as well as deliver effective, new methods of integrating technology and curricula. (Contains 17 references and 8 tables.) (Author)

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The Regional Educational Technology Assistance Program: Its Effects on Teaching Practices

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Abstract

This article discusses the effects of the Regional Technology Assistance Program (RETA) on the teaching practices and collegial behaviors of its participants and instructors. We present findings that suggest that, as a result of their involvement in RETA's ongoing, peer-directed, constructivist-based professional development workshops, teacher participants and teacher instructors have: (1) increased their use of technology in the classroom, (2) increased their use of certain constructivist practices in the classroom, (3) increased their collaboration with other teachers, and (4) assumed more leadership positions. Successful reorientation of teachers from direct instruction to constructivist teaching methods must alter teachers' epistemologies. Professional development, then, must address the beliefs held by educators and the methods in which they incorporate those beliefs into their teaching as well as deliver effective, new methods of integrating technology and curricula. (Keywords: change, collaboration, professional development, teachers, technology.)

The Regional Educational Assistance (RETA) program provides professional development opportunities for teachers and administrators to improve teaching performance, educational leadership, and student learning through increased understanding and use of learning technologies. In this article, we discuss the effects of RETA on the teaching practices and collegial behaviors of its participants and instructors. We present findings that suggest that, as a result of their involvement in RETA's ongoing, peer-directed, constructivist-based professional development workshops, teacher participants and teacher instructors:

- increased their use of technology in the classroom
- increased their use of certain constructivist practices in the classroom
- increased their collaboration with other teachers
- assumed more leadership positions

Reporting on qualitative case study data, we describe more concretely how children's learning environments and experiences change as a result of their teachers' involvement in the RETA project. We also share our interpretations of why these changes are occurring and how best to sustain them.

CONTEXT

RETA professional development workshops are available to all teachers in public, private, and federally funded schools in New Mexico but are particularly

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focused on the needs of teachers and students in high-poverty schools. New Mexico is a minority majority state with a school population that is about 48% Hispanic, 39% White, 10% Native American, 2% African American, and 1% Asian. In many New Mexico districts, the dropout rate is 50% (Davis, 1997). One in every four children in New Mexico lives in poverty, and one in every three receives daily free lunch in school. These children are in the greatest need of an education that prepares them to fulfill their potential and, ultimately, to secure and maintain productive employment in the 21st century. For this to occur, administrators and teachers require professional development and access to higher education.

During the 1999–2000 school year, RETA directly served more than 2,400 teachers in the state of New Mexico. These teachers represented more than two-thirds of the state's public school districts and a number of U.S. Bureau of Indian Affairs schools, including Northern and Southern Pueblo schools and Eastern and Western Navajo schools. Unlike other programs that primarily reach teachers in the Rio Grande corridor (which runs through the center of the state), RETA served teachers practicing in all of New Mexico's geographic regions.

The major thrust of the RETA project is to combine an exemplary, technology-rich, standards-based curriculum with model pedagogy and a supportive learning network to positively affect the skills and abilities of teacher participants.

THEORETICAL FRAMEWORK

The presidential report on the use of technology in K–12 education describes technology as supporting the current pedagogical shift in education toward the constructivist paradigm (Kent & McNergney, 1999). Constructivist learning is more responsive to students' prior knowledge and promotes greater attention to the acquisition of higher-order thinking and problem-solving skills. This shift away from traditional methods of instruction is based on the premise that it is learning *with*, not *from* or *about*, technology that makes computer-based technologies important tools in a constructivist learning environment (Boethel & Dimock, 1999). Educational technologies offer powerful ways of engaging in authentic forms of learning. With a clear focus on program goals and the provision of extensive professional development opportunities, training must provide real-world experiences for teachers and administrators who have direct effect on the instruction of students. Only those educators who understand the medium will use its currency and authenticity to their advantage (Adams & Burns, 1999; McKenzie, 1999).

The traditional focus of professional development in technology has been on showing teachers how to operate equipment rather than how to integrate the technologies into instruction (McCannon & Crews, 2000). However, educators need to learn how to use technology in context, matching the needs and abilities of learners to the curriculum goals (Kent & McNergney, 1999). Successful reorientation of teachers from direct instruction to constructivist teaching methods that incorporate technology must alter teachers' epistemologies. In a study that sought to understand what teachers believe about the nature of

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knowledge and learning and how these beliefs, or epistemologies, affect their curriculum implementation and instructional approaches, Howard, McGee, Schwartz, and Purcell (2000) found that "constructivist approaches to training teachers may actually produce epistemological changes in line with constructivist philosophies" (p. 459). In addition, they found that successful reorientation of teachers may partially depend on teachers having sophisticated epistemologies. Professional development, then, must address the beliefs held by educators and the methods they use to incorporate those beliefs into their teaching, as well as deliver effective new methods of integrating technology and curricula. Becker and Riel (2000) found that professionally engaged teachers have a more constructivist approach to teaching than teachers who do not engage in professional development opportunities.

RETA's model of professional development addresses the standards set forth by the National Staff Development Council (NSDC, 2000). These guidelines steer professional development planners into critical analysis of intended outcomes and define a clear infrastructure for achieving those outcomes. The structure of RETA workshops has come to incorporate several of the NSDC's prominent strategies. RETA's tenets are primarily aligned with the following beliefs:

- Teachers need adequate time for the phases of the change process: initiation, implementation, and institutionalization.
- Teachers and staff members learn and apply collaborative skills to make shared decisions, solve problems, and work collegially.
- It is important to address diversity by providing awareness and training related to the knowledge, skills, and behaviors needed to ensure an equitable and quality education for all students.
- Educators need to create challenging, developmentally appropriate curricula that engage students in integrative ways of thinking and learning (NSDC, 2000).
- RETA's professional development model embodies these and other research-based characteristics.

A significant component in the RETA program is the use of teachers to train other teachers. The literature suggests that sustained, lasting change in performance is most likely to occur when teachers participate in a support network with partners (McKenzie, 1999; Norton & Gonzales, 1998). Building communities of learners, allowing teachers to network and share ideas with their peers, provides the opportunity for opening the isolated classroom and bringing in new resources to support new models of teaching (Riel & Fulton, 1998). Because teacher-instructors understand classroom culture and the demands of teaching, their guidance is often more relevant and credible to other teachers. Hence, they use their sophisticated epistemologies to influence the reorientation of teachers seeking ways to alter their teaching strategies (Howard et al., 2000). Our data show that teacher-participants in RETA professional development training sessions are veteran teachers seeking to enlighten themselves. These teachers are consistent with Stage 3 of Glatthorn's (1996) stages of career development—Experimentation or Reassessment—and they are prime candidates for reorienting their teaching methods to include new pedagogical perspectives.

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Given the potential of technology to transform learning and teaching as well as the challenges of implementing technology within established classroom traditions, the RETA project looked for the most effective way to provide professional development along with ongoing support. Weekend workshops offered in different areas of the state seemed the best way to provide access to technology for working teachers. These workshops were designed to provide opportunities for teachers to (1) experience excellent models of technology integration and (2) think systematically about the translation of those models into classrooms in their districts.

It became clear that teachers do not need to be told what to do. Instead, they need examples of good practice and support in strategies for integrating technology. Thus, RETA's focus is the emphasis of curriculum integration of technology over technological mechanics and mastery of software.

Is professional development a catalyst for change in classroom practice? According to *Does Professional Development Change Teaching Practice? Results from a Three-Year Study* (U.S. Department of Education [ED], 2000), it is. This study, which examined professional development programs that educated teachers about specific teaching strategies, showed that teachers who participated in these programs increased their use of modeled strategies in their classrooms. By exposing teachers to effective classroom strategies involving the integration of technology and by giving them time to learn and adapt those strategies, professional development does affect classroom practice. Teachers begin to use what they learn in the workshops, adapt it to their specific needs, and change their teaching strategies to better facilitate student learning. Teachers then take the initiative to create the same settings, such as collaborative work and student-initiated activity, for their students (Becker & Riel, 2000).

Another finding in the ED (2000) study suggests that there is "a substantial benefit when teachers from the same school, department, or grade level participate together in technology-related professional development" (p. 48). This supports the NSDC's (2000) standard stating that "Effective staff development is aligned with the school's and the district's strategic plan, provides adequate time for staff members to work together to accomplish the school's mission and goals, and increases staff knowledge and practice of interdisciplinary team organization and instruction" (p. 48). Teachers who participate in professional development together benefit from relying on one another in developing technological skills and are more likely to perform collaboratively in the education of their students. RETA's policy of encouraging teams of teachers from schools promotes the premise presented and substantiated in both of these documents, which in turn corroborates the constructivist theory of learning on which RETA professional development is based. RETA professional development workshops foster these and other practices noted in the national studies.

RESEARCH METHODS

Serving as an external evaluator for the project, the Education Development Center's Center for Children & Technology (CCT) has documented in various ways the effect of RETA on teachers' classroom practices and their professional

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beliefs and behaviors. To the extent possible, we have also examined how teachers' participation in the project has affected students' classroom experiences.

This section reviews the data collection and analysis methods employed in this evaluation. CCT conducted both qualitative and quantitative research during the 1999–2000 school year. The methods described in the following sections were used to collect information from and about RETA participants.

Pre- and Postworkshop Surveys

Surveys were administered to teacher participants during the first RETA workshop they attended and then again at the final workshop toward the end of the school year. The instruments collected demographic data from the teacher participants as well as information about teachers' computer use, classroom practices, and attitudes toward technology. Open-ended questions asked about the aspects of RETA workshops that participants found most useful, the things that teachers did in their classes as a result of what they learned in RETA, and participants' recommendations for improving the project. We performed matched-pair analyses on these data, analyzing only cases in which both pre- and postworkshop surveys were completed ($n = 190$).

Participant Workshop Evaluations

This evaluation was mailed to participants following the final RETA workshop. Teachers were provided with an addressed, stamped envelope and instructed to return the evaluation form to CCT.

The instrument collected data on participant demographics, including some information differing from that collected in the pre- and postworkshop surveys. It also asked teachers to rate their experience in the RETA workshops according to instructor skill and knowledge as well as workshop content. Open-ended questions probed issues such as how diversity is addressed in the workshop implementation as well as content and recommendations for improvement.

Because these questionnaires were mailed instead of distributed at the sessions, we received comments from participants who did not complete the pre- to postworkshop analysis. For instance, approximately 20% of respondents indicated that they dropped out of RETA after completing only one workshop. For the Workshop Evaluation Form, we analyzed all cases ($n = 170$).

Instructor Interviews

In spring 2000, we began documenting the professional stories of five RETA instructors. We opted to focus on instructors because this population has the most prolonged exposure to and experience with RETA. We expected that, if we were to be able to observe any effects of RETA in the relatively short time available for the evaluation, it would be with these participants.

We selected a sample of instructors who represented a variety of factors judged to be important—ethnicity, years in RETA, teaching assignment (including grade level), region of the state, and student demographics—and we conducted lengthy interviews with each of these individuals. The interview protocol included questions about perceived goals and activities of RETA; what RETA has meant to them personally and professionally; what a typical school

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day was like before and after RETA; and where, in the students' products and performances, they would look for evidence of RETA's effects.

Instructor Observations

During the spring of 2000, evaluators from CCT attended and observed three RETA workshops led by three different RETA instructor teams. These workshops were held in different regions of the state—southern, western, and northern New Mexico. Workshop topics were Introduction to Digital Portfolios; Conclusion and Sharing of Digital Portfolios; and Changes, a thematic session in which participants designed lessons using various computer technologies to help students explore changes in their communities and the world.

Observations focused on both instructor and participant behaviors. For instance, we noted how the instructors organized the session, how they adapted the RETA curriculum to fit the needs of their participants, and how they interacted with the participants and each other. Similarly, we documented participants' questions and comments as well as the areas they seemed to have difficulty understanding—technology or content. We informally interviewed the participants about bridge-to-practice issues and how they would use what they had learned in RETA once they returned to their own classes; we also debriefed with instructors following the session.

CCT evaluators also visited and observed four classes of students whose teachers were RETA instructors. These included a seventh-grade media class in a southern New Mexico city, a third-grade class in a medium-sized central New Mexico town, a sixth-grade class in a small central New Mexico town, and a combined first- and second-grade class in a very small western New Mexico reservation community.

Classroom observations focused on student demographics, students' and teachers' activities with technology, and constructivist pedagogical practices. For instance, researchers recorded if and how students collaborated in the classroom as well as how they interacted with computers—what applications they used and for what purposes. Similarly, we documented the teachers' goals and their teaching practices (e.g., open-ended questioning, demonstrating technology, lecturing, and consulting with individual students or groups). In all but one case, evaluators conducted these observations in pairs.

Instructor Self-Assessments

This instrument was administered on the Web and was posted on a secured area of the RETA Web site. Instructors were asked to complete it by mid-June, following their final workshop. This instrument, which parallels the Participant Workshop Evaluation, queries instructors about their own skills and knowledge as well as their thoughts about their workshop implementation and suggestions for improving the project.

All appropriate cases of the instructor self-assessment were analyzed ($n = 51$). Three cases were omitted because they were completed by new workshop leaders who had not yet led any sessions. In addition to collecting the self-report data through the instruments cited above, CCT researchers also conducted site visits to RETA workshops and classrooms. Protocols were established to observe these events systematically.

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Data Analysis

Quantitative data were analyzed using generally accepted statistical practices. Qualitative data were thematically coded and then statistically analyzed. However, qualitative data were also used in a formative way to develop instrumentation (e.g., the instructor interview protocol) and to assist in the interpretation of quantitative data.

PRIMARY FINDINGS

In this section, we report on data gathered during the 1999–2000 school year using the aforementioned instruments and processes. Data from the pre- and postworkshop surveys, the interviews, and observations revealed that involvement with RETA, on the part of both the workshop participants and the workshop instructors, served to transform these teachers' attitudes about and involvement with technology, their teaching practices, and their beliefs about their own ability to act as a leaders in the educational technology field.

Changes in Teachers' Access to Computers and the Internet at Home

RETA workshop participants reported greater home access to computers and the Internet after they completed project workshops. Prior to their involvement in the project, the majority of RETA workshop participants ($n = 159$) indicated that they had access to home computers; 16% ($n = 30$) did not have access. However, by the end of the year, those with home access became an even larger majority. A full 88% had access, while 12% of participants ($n = 23$) continued to have no home access to computers. During the year-long course of RETA instruction, 4% of the teachers ($n = 7$) acquired home computers.

Similarly, at the beginning of the school year, two-thirds of participants ($n = 125$) indicated that they had home access to the Internet; 33% ($n = 62$) did not have access. After participation in RETA, 71% of workshop participants ($n = 135$) reported having home Internet access; 23% continued to be without it. Among the teachers, 9% ($n = 17$) acquired home connections to the Internet during the year.

Like the workshop participants, RETA instructors—many of whom had little or no experience with computer technology before the RETA program—have also chosen to increase their access to technology in their homes. One RETA instructor, who served as a subject of our case study, noted the changes over the past few years in her own and her family's access to and involvement with computer technology: "I [now] have two computers and a laptop. My sons go to computer camp. I didn't have that before I joined the program. Personally, technology is embedded in my life from these [programs]."

Changes in Teachers' Personal Use of Computers

RETA participants noted that they used e-mail and the Web in their personal lives more often following their involvement in RETA workshops. In pre- and postworkshop surveys, they commented on how often they used certain computer applications. Most notable in their responses were changes in the frequency with which they made use of e-mail and the Web. Data on these practices are displayed in Table 1.

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Table 1. Changes in the Frequency with Which RETA Teachers Use E-Mail and the Web

	E-mail		Web	
	Preworkshop	Postworkshop	Preworkshop	Postworkshop
Never use	14%	**3%**	12%	**5%**
Use daily	47%	**64%**	34%	**44%**

During or following participation in RETA, 17% more teachers ($n = 30$) began using e-mail every day, and 10% more ($n = 18$) began using the Web every day. Previously they had not used these technologies so regularly. Furthermore, 7% to 11% of teachers indicated that they used the Web and e-mail, respectively, for the very first time during the course of the year.

Changes in Teachers' Access to Computers and the Internet at School

RETA participants indicated that they had greater Internet access at school following their involvement in RETA. It is not known whether their schools acquired connectivity during this time or whether the teachers simply became aware or empowered enough to seek out this kind of access. Whatever the case, at the beginning of the 1999–2000 school year, more than three-quarters of RETA workshop participants ($n = 147$) reported having access to the Internet at school; 18% ($n = 35$) said they did not have access. At the end of the year, 93% of teachers indicated that they had school access, while 7% continued to lack Internet connectivity at school. Among the teachers, 11% ($n = 21$) acquired Internet access at school during the year.

Changes in Students' Use of Computers in the Classroom

RETA participants reported using e-mail and the Web more with their students following their involvement in RETA. See Table 2 for data on students' use of e-mail and the Web.

Table 2. Computer Applications RETA Teachers Use with Their Students

	E-mail		Web	
	Preworkshop	Postworkshop	Preworkshop	Postworkshop
Never use	78%	**64%**	52%	**34%**
Use 2–3 times per year	4%	**10%**	12%	**10%**
Use monthly	5%	**8%**	12%	**20%**
Use weekly	12%	**18%**	24%	**36%**
M	0.52	**0.81**	1.08	**1.58**

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Most notable in these data are changes in teachers who reported having never used e-mail or the Web with their students and those who reported using it on at least a weekly basis. By the end of the RETA experience, more than one-third of the participants indicated that they used the Web every week with their students; this figure was up 12% from reports at the beginning of the year. Similarly, following RETA workshops, fewer teachers indicated that they never used e-mail or the Web with their students. No significant changes were reported in teachers' use of other applications—word processing, spreadsheets, databases, computer programming, or hypermedia—with their students.

Increased Integration of Computers

The data from the surveys, interviews, and observations indicate that not only are RETA participants and their students using computer technology more often, but also that RETA has changed the way in which teachers use computers in their teaching. Following their involvement with RETA, a greater number of workshop participants (43%; $n = 79$) stated that they used computers most often as "an integrated part of learning." Before RETA, only 24% of teachers ($n = 42$) indicated that they used computers as an integrated part of their content lessons. In contrast, prior to participation in RETA, 47% ($n = 84$) reported that they used computers most often to "support students learning skills." See Figure 1 for a summary of these data.

In confirmation of the data, RETA instructors also claimed that their involvement with RETA helped them understand how to incorporate computer technology more effectively into their teaching. One instructor stated, "Because of RETA I went from software-driven to curriculum-driven technology. Before [RETA] I was always looking for that cute software. I was always using the computer as a reward. I saw myself change." Another instructor claimed that, although she had used computers to some degree before participating in RETA, "[RETA] gave me ideas to use in my classroom." She emphasized that she saw the computer as just one tool among many in her classroom. "I don't try to re-

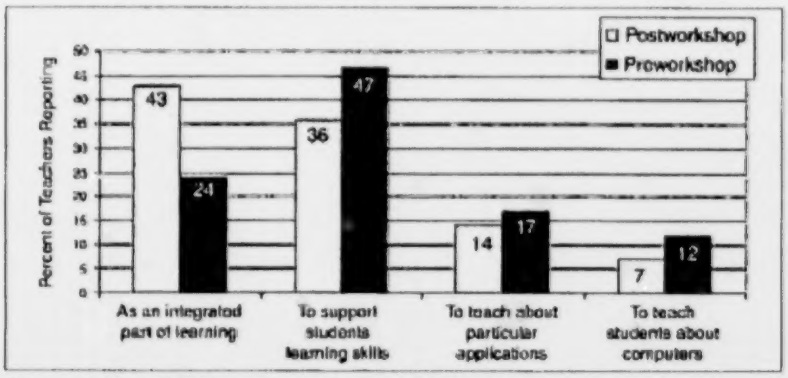

Figure 1. How RETA teachers use computers in the classroom.

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place paper and pencil with the computer. I read to [my students] every day." Instead of focusing on teaching computer skills, she designs her lessons, "on a theme basis," and exposes students to that theme from numerous angles. For each theme, "the students have a computer component, a language arts component, a spelling component, and a math component."

An observation revealed how this teacher put her thematically integrated strategy into action. As her students worked on a research project, some children wrote quietly at their desks, others word processed their reports, while still others searched for information on the Internet. Computer usage was a means for students to accomplish a curricular goal, but it was not an end in itself. This teacher described how her students now saw the computer as an integral but routine part of the classroom: "They don't ask me if they can play on the computer. If there's something they need to do, they know they can go use the computer; they don't ask. ... They use it and feel comfortable with it as a natural tool in the classroom."

Use of Computer Applications to Support Teaching

In a complementary finding, participants also reported that they used a combination of computer applications more often after participating in RETA workshops. Changes in these patterns of use were again most marked among those who reported using computers on a weekly basis.

By the end of RETA, fully one-third of the participants said that they used a variety of applications to support units every week. Less than 15% (down from more than a quarter) indicated they never used computer applications to support lessons. Table 3 presents these data.

Table 3. Frequency with Which Teachers "Use a Combination of Computer Applications as Part of a Particular Unit"

	Preworkshop	Postworkshop
Never use	26%	**13%**
Use weekly	30%	**33%**
Mean rating	1.59	**1.86**

Use of Learning Centers

Learning centers are physical areas in a classroom that include all of the resources (tools and materials) that students need to work collaboratively on defined tasks and projects. Children generally rotate through these centers, which are considered a sound part of constructivist learning environments.

Following their involvement in RETA workshops, participants reported that they were using this organizational/pedagogical strategy more often in their classes. At the beginning of the year, 30% ($n = 50$) indicated that they had never used learning centers; by year's end, only 18% ($n = 33$) reported this. Similarly, before RETA, 26% ($n = 43$) stated that they used centers at least on a weekly basis; after RETA workshop experiences, 34% ($n = 61$) said the same. See Table 4 for data about the use of this practice.

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Table 4. Frequency with Which Teachers "Use Learning Centers" in Their Classes

	Preworkshop	Postworkshop
Never use	30%	**18%**
Use 2–3 times/year	17%	**26%**
Use monthly	27%	**22%**
Use weekly	26%	**34%**
Mean rating	1.49	**1.71**

Use of Rubrics to Assess Learning

After their RETA experiences, workshop participants noted that they began using rubrics more often to assess their students' work. Postworkshop, nearly one-third of the teachers ($n = 53$) indicated that they used rubrics, whereas before RETA, only 23% ($n = 39$) said this. Keeping with the trend of prior data patterns, 21% ($n = 36$) reported that they never used rubrics before participating in RETA. After RETA, this percentage was down to 16% ($n = 29$).

Although RETA teachers claimed to make greater use of measurement rubrics, one RETA instructor cautioned that, however innovative teachers might try to be, if administrators do not support these innovations, teachers are unlikely to continue using them. This instructor argued that his district's teacher evaluation process has not kept up with the times. When he presented his principal with what he felt was an innovative assessment rubric, it was met with neither interest nor excitement. In his view, transformation of teacher practice can be accomplished only when administrative practices and values are transformed as well.

New Approaches to Pedagogy and Curriculum

During interviews, teachers described how their experience with RETA had affected the learning environments they created for their students. The teachers discussed different sorts of activities and lessons that they had begun to use as a result of participating in RETA. These included the following:

- WebQuests in which students gathered information about subjects as diverse as the solar system and Ancient Egypt
- e-collaboratives in which students communicated with other young people around the world, collected postcards, and tacked them up to maps on the wall
- PowerPoint (1987–2000) presentations prepared for alien visitors in which students presented an imaginary trip around the state, including geographic and historic highlights and distances between these sites
- identity quilts in which young children used Kid Pix (1990–2001) to create and assemble portraits of themselves
- electronic portfolios in which students selected and assembled examples of their best work

The teachers talked about how their approaches to and thoughts about teaching had changed with their participation in the project. One rural high school

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teacher suggested that what he had learned about technology in RETA had enabled him to reach more students, particularly the visual learners. Previously, he claimed, even when children had a talent for art, "I would tell them, 'You need to write about [the lesson],'" rather than allowing them to express themselves visually. The technology, however, "allows [these students] to see in more abstract ways, to be able to conceptualize what's in their imaginations." Another teacher admitted, "My classroom was probably a pretty boring place to be before the technology." In her preworkshop classroom, "Kids sat in rows with big, heavy books. That's how I was taught." A third teacher and workshop instructor stated that, before her involvement in RETA, "I didn't do as much theme work." Although she had tried to employ constructivist teaching practices as a teacher before taking part in RETA, her increased comfort with technology allowed her to take advantage of a diverse array of tools and resources. "I always worked with groups, but it was more directed instruction rather than self-discovery. I was always into having [students] do research reports, but of course I didn't have all these tools we have. ... Having several [tools] has made me think with a more integrated approach."

In describing how she uses technology, another instructor commented:

> Before they could read *The Diary of Anne Frank*, they had to do a quick review of background material [in the form of] a WebQuest. We have two reporters, and they have to do an article about what WWII was like. Most have decided to do a mock magazine. Last semester, we read *The Giver*, and we did a whole naming ceremony, did a genealogy search, made a coat of arms, etc., went on the Internet; kids found sites that they didn't even know about. We did PowerPoint [1987–2000] and HyperStudio [1989–2000]. I've found that in Language Arts it's very easy to incorporate technology.

Verona, a Native American teacher who had moved off the reservation to attend college and then returned home to teach, felt somewhat estranged from a community that she believed discouraged questioning. She used RETA workshops as an opportunity to explore this situation and to exchange ideas with peers. In a workshop that we observed, Verona described a lesson she had tried last year. The lesson asked Native American children to reflect on how technology was changing their lives. The teacher recalled that her students had defined technology far more broadly than she. Though she had been thinking primarily about computer technology, the children brought up casino technologies (such as the gambling machines and surveillance cameras) and food technologies at McDonald's.

Verona suggested that new ways of teaching, fostered by technology, encouraged the children to question things and, thus, almost always created cultural conflicts. She noted that questioning was not the way of the tribal elders or of the community at large historically. With the guidance of RETA instructors, Verona began to think about how she might collaborate with the school's culture teacher (a Native American elder) in developing a technology-enhanced

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lesson in which the conflict between critical thinking and cultural values and traditions was explored.

Increased Collaboration with Other Teachers

Verona's desire to collaborate with colleagues is not surprising. RETA teachers indicated that they collaborated more often and in more varied ways with colleagues after they had participated in the project. Workshop participants were surveyed about how and how often they assisted other teachers in dealing with software and hardware problems as well as curriculum design and integration issues. Participants were asked to rate their engagement in collaborative practice, with 0 indicating having never engaged and 5 having daily engagement.

These data are consistent with those from a survey administered to RETA participants last year, suggesting that increased collaboration is a real and substantial effect of RETA. They are also consistent with findings from the postworkshop survey open-ended questions in which participants indicated that a major benefit of the RETA workshops is the opportunity to meet and exchange ideas with peers. Analysis of their responses pre- and postworkshop indicated significant increases in all four areas (Table 5).

Table 5. Changes in RETA Teachers' Collaborative Practices

Collaborative Practice	Preworkshop *M*	Postworkshop *M*	*p*
Assist other teachers with technical problems involving computer hardware	1.48	1.79	.000
Assist other teachers with technical problems involving computer software	1.41	1.66	.004
Assist other teachers in designing curriculum that uses computers	1.00	1.25	.004
Assist other teachers in brainstorming/ discussing issues related to computer use	1.55	1.84	.002

Instructor interview data also corroborate these findings. RETA instructors described increased collaboration as one of the most significant effects RETA had on their professional lives. They eagerly recounted how their experience in the project had encouraged and motivated them to share their own resources and practices with other teachers. "It's so funny what RETA does to you," remarked one instructor. "Now I start doing something and I think, 'Oh, I should share this.' When I find a new site, I send it out to the listserv. I'm always looking for what's out there and what's next. I'm always looking for what I can share."

When another instructor was asked what RETA meant to him, he replied, "friendship, professional collaboration, a sense that what I'm doing is right, that I'm on the right track."

The experience of at least one instructor indicates that the impetus to collaborate extends beyond the RETA context. One of the RETA instructors won a

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Christa McAuliffe teaching fellowship. When she attended the fellows meeting, she picked five other teachers across the country with whom to form an e-mail partnership, which allowed the teachers to offer professional support and advice to each other.

Increased Participation in Positions of Leadership

RETA instructors described at length how participation in the project had given them the confidence and the clout to take on positions of leadership at their schools and districts. "Professionally, [RETA] enabled me to step forward in a way that I may not have been able to do before," observed one RETA instructor. "I've gone to conferences. I've been one of the readers for the district technology plans and technology challenge grants. Those types of things I wouldn't have had the opportunity to do." Another instructor has taken over the job of maintaining the server at her school. In addition, after receiving a national teaching fellowship, she used her award money to initiate a program called CyberTechs, in which high school students are paid to help teachers in the district set up and troubleshoot software and hardware. Another RETA instructor told us that she had begun conducting workshops for fellow teachers at her Pueblo elementary school and that she was even considering starting up a parent course. "I've already been in charge of two school labs and community lab situations, those types of things. All of this happened after the first RETA workshop."

Teacher-instructors with little or no experience at all in computer technology before RETA have found themselves, after a few years in the program, taking on responsibilities they never would have envisioned for themselves. One instructor described her experience:

> I started as a teacher who taught teen moms about nurturing and breastfeeding. When [RETA] found me and trained me, they empowered me to learn Excel [1985–2000], PowerPoint [1987–2000], and by the fourth year, I was a journalism teacher teaching totally on machines. And it's only because RETA taught me how to do project-centered work. Then I was appointed curriculum facilitator and technical trainer for two schools. ... I got to speak at the New Mexico Technology Conference in Albuquerque. You know you've done well when you get to present at a state technology conference. I'm being held up as a model. So you can see the rapid growth.

Another RETA instructor in a rural school district claimed that the skills she has gained through the RETA program have helped her feel that she is having an effect on her community. "I love power, and being that [mine] is a small district, I have been able to be a real big part of what's happening in the technology area. People seek me out with questions. I get known at central office. Just like the kids, this gives me a feeling that I'm contributing something."

Increases in Confidence

Across the board, RETA participants stated that their confidence—in technology and themselves—had increased as a result of participating in the project.

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During interviews, participants frequently indicated amazement at their own progress and achievements and thanked RETA for its role in helping them feel more confident working with technology, collaborating with other teachers, teaching other teachers, and assuming positions of leadership. This finding was confirmed in an analysis of the postworkshop survey open-ended questions in which respondents indicated that increased confidence with using technology was an outcome of their participation in the RETA program.

One RETA instructor described her experience succinctly. She stated, "Personally, [RETA's] definitely given me much more confidence. Though I always go into a workshop thinking I don't know enough, it's been a good step out into the void for me." Another teacher stated that, though she still does not feel like a technical expert, she does feel as though she can use computers effectively. She believes that her own increased confidence has helped to boost the confidence of the technology team at her small Pueblo school. She considered it a significant success that her team had started trying to solve technology problems on their own before looking outside for help. "We were in the habit of always going out to get consultants to troubleshoot and solve problems," she said. "Now, the group stays in-house a little more." Her technology team is now drafting a technology plan and considering putting together a curriculum sequence specifying what children in the community should learn about computing.

These stories and others collected from interviews with RETA participants and instructors suggest that increased confidence is a significant effect of the RETA project. Confidence creates opportunities for personal growth and career advancement for teachers, and a belief in their own competency can help teachers feel more comfortable experimenting with new software and technology-enhanced curricula.

Key Findings from Participant Postworkshop Survey Open-Ended Questions

Overall, respondents to the open-ended questions on the postworkshop survey were positive about their experiences with RETA. The majority noted that they had learned information about both specific applications and their developmentally appropriate use with students and about how to integrate technology into activities across the curriculum. Participants also indicated that the structure of the RETA experience was effective, providing opportunities for hands-on experience, supportive instruction, and collegial conversations (Table 6).

When asked specifically about what they had learned about technology, the majority of respondents indicated that they learned to use an application (Table 7).

In addition, participants indicated that they learned to view technology as an asset to teaching (Table 8).

In responding to questions about technology activities in their classrooms, the majority of participants responded that they had students work with various applications to create multimedia presentations (45%) and use the World Wide Web for research (39%). These answers reflect the increase that teachers reported, in both interviews and in responses to survey questions, in their overall use of technology; they also can be viewed as an outgrowth of teachers' reported increased sense of confidence in their use of technology (29%).

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Table 6. Aspects of the RETA Workshops Found Most Useful

Learning specific applications	38%
The hands-on experience	21%
Peer interactions and networking	15%
Help from friendly and knowledgeable instructors	13%
All aspects were useful	12%

n = *174. Individuals may have responded in more than one category.*

Table 7. What RETA Participants Learned about Technology

A specific application or applications	57%
How to teach about technology and using technology	11.5%
That technology can be trying and stimulating	5%
To have more confidence using technology	5%
Other aspects of technology	42%

n = *161. Individuals may have responded in more than one category.*

Table 8. What RETA Participants Learned about Teaching with Technology

Technology is a useful and motivating tool to be integrated into the curriculum	33%
Many activities to apply in the classroom	19%
Learning technology is easier than I thought and requires much patience	15%
More information on a specific application	9%
Other	35%

n = *156. Individuals may have responded in more than one category.*

When asked about changes they would recommend to the RETA program, the majority either stated that they had no complaints or provided positive feedback regarding the overall program. Some suggestions, however, included providing more workshops, longer sessions, more options for participants in terms of location or timing of workshops, more variation in terms of technical level addressed in each workshop, and more focus on specific age ranges that teachers teach. Other suggestions included improving communication between program administration and participants and improved timing for delivering software to participants. These suggestions will be used to improve the RETA program.

CONCLUSION

These evaluation results have enabled project staff to conclude that the RETA program has met and, in many cases, exceeded expectations. RETA has served a substantial number and variety of teachers and students across the state of New Mexico. Novice and experienced teachers; teachers at the elementary, middle, and

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high school levels; and teachers of diverse ethnic and cultural backgrounds have taken part in the project as both workshop participants and workshop instructors.

These educators have provided data that suggest they have replanted RETA ideas and resources in their schools and classrooms, affecting the teaching and learning of countless children. Teachers' uses of computers are geared more to gaining computer competence and less toward computer skills. This extends to more constructivist approaches where computers are tools used to improve students' communicating, thinking, producing, and presenting their ideas (Becker & Riel, 2000). Findings about collegial practices demonstrate that participation has also significantly affected how teachers collaborate with others. Information describing classroom activities and conversations offer further support that the teachers are applying and internalizing the resources and best practices advocated by the RETA project.

A significant increase was found in the use of (a) a variety of computer applications in teaching units, (b) technology as integrated parts of content learning, (c) learning centers, and (d) rubrics to assess learning. Through participation in RETA professional development workshops, teachers are learning how to use technology in context, matching the needs and abilities and learners to their curricular goals (Kent & McNergney, 1999). These results offer support for the belief presented by Howard et al. (2000) that training teachers in a constructivist manner may produce epistemological changes that affect classroom practices.

A significant change was found in how teachers collaborate with others. They do so more often and in more ways, including (a) troubleshooting hardware and software, (b) designing curriculum units that incorporate technology, (c) brainstorming and discussing issues related to technology integration, and (d) sharing information and resources. This involvement with RETA provides opportunities necessary for building communities of learners as well as bringing in resources to support new models of teaching (Riel & Fulton, 1998). Because the structure of the RETA workshops incorporates several of the NSDC's (2000) prominent strategies, teachers and staff members are exposed to and participate in opportunities to learn and apply collaborative skills to make decisions, solve problems, and work collegially. With the confidence, motivation, and collaboration fostered by participation in RETA, teachers indicate a willingness to pursue and serve in positions of leadership at the school, district, community, and state levels. They are also more likely to motivate others to become more empowered with technology. These benefits result in greater teacher collaboration in accomplishing their schools' missions and goals (NSDC). Our research findings support national studies in professional development (Becker & Riel, 2000; ED, 2000; NSDC). ■

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References

Adams, S., & Burns, M. (1999). *Connecting student learning and technology.* Austin, TX: Southwest Educational Development Laboratory.

Becker, H., & Riel, M. (2000). *Teacher professional engagement and constructivist-compatible computer use.* Center for Research on Information Technology and Organizations. Irvine: University of California, Irvine, and University of Minnesota.

Boethel, M., & Dimock, K. (1999*). Constructing with technology: A review of the literature.* Austin, TX: Southwest Educational Development Laboratory.

Davis, M.J. (1997). *The accountability report: Indicators of the condition of public education in New Mexico.* Santa Fe: New Mexico State Department of Education.

Excel [Computer software]. (1985–2000). Redmond, WA: Microsoft.

Glatthorn, A. (1996). *The teacher's portfolio: Fostering and documenting professional development.* Rockport, MA: Pro>Active Publications.

Howard, B., McGee, S., Schwartz, N., & Purcell, S. (2000). The experience of constructivism: Transforming teacher epistemology. *Journal of Research on Computing in Education, 32*(4), 455–465.

HyperStudio [Computer software]. (1989–2000). Torrance, CA: Knowledge Adventure, Inc.

Kent, T., & McNergney, R. (1999). *Will technology really change education?* Thousand Oaks, CA: Corwin Press.

Kid Pix [Computer software]. (1990–2001). Novato, CA: The Learning Company.

McCannon, M., & Crews, T. (2000). Assessing the technology training needs of elementary school teachers. *Journal of Technology and Teacher Education, 8*(2), 111–121.

McKenzie, J. (1999). *How teachers learn technology best.* Bellingham, WA: FNO Press.

National Staff Development Council. (2000). *NSDC for educators* [Online]. Oxford, OH: Author. Available: www.nsdc.org/educatorindex.htm.

Norton, P., & Gonzales, C. (1998). Regional educational technology assistance—Phase II: Evaluating a model for statewide professional development. *Journal of Research on Computing in Education, 31*(1) 25–48.

PowerPoint [Computer software]. (1987–2000). Redmond, WA: Microsoft.

Riel, M., & Fulton, K. (1998, April). *Technology in the classroom: Tools for doing things differently or doing different things.* Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.

U.S. Department of Education, Office of the Under Secretary, Planning and Evaluation Service. (2000). *Does professional development change teaching practice? Results from a three-year study.* Washington, DC: Author.

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